

The 3rd International Conference on e-Learning
ICEL2011, 23-24 November 2011, Bandung, Indonesia

A Comparative Study Among Selected Global Standards: i-Learn as A Case Study

Nurmaisara Za'ba^a, Mohd Nor Mamat^b, Mohd Ali Mohd Isa^a, Azlan Abd Aziz^a,
Prasanna Ramakrisnan^a and Nurul Hidayah Mat Zain^{a*}

^aFaculty of Computer and Mathematical Sciences, Universiti Teknologi MARA, Shah Alam, Selangor, Malaysia

^bi-Learn Centre, Universiti Teknologi MARA, Shah Alam, Selangor, Malaysia

Abstract

Management System (LMS) is a web based application where the learners are able to log on as well as access the courses which are allocated online to them. However, most LMS will simply manage the learning contents, the learning history data, the test results, and many more without managing the learning itself. Thus, the choice of an LMS is an important part of an organization's e-learning strategy and it will affect the organization for long period of time. Sharable Content Object Reference Model (SCORM) is a standard that allows the interoperability of learning tools and course content and provides a collection of specifications adapted from multiple sources to offer a comprehensive suite of e-learning capabilities that enable interoperability, accessibility and reusability of Web-based learning content. i-Learn Portal is the LMS platform that promote information sharing and resources for the academicians and students of the Universiti Teknologi MARA (UiTM), and the portal also provides standard content for the respective courses for student's perusal, extending the discussion or lecture at a class. The i-Learn Centre (i-LeC) of UiTM realizes that there is a need to standardize the i-Learn Portal towards world recognized LMS and therefore this paper will discuss SCORM and other selected global standards such as IEEE LTSC and IMS Global Consortium for the standardization.

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Selection and peer-review under responsibility of i-Learn Centre, Universiti Teknologi MARA, Malaysia

Keywords: Learning Management System (LMS); Sharable Content Object Reference Model (SCORM); i-Learn

Corresponding author. E-mail address: nurulmz@tmsk.uitm.edu.my

1. Introduction

E-learning is the online learning that was recognized as the only feasible method of delivering knowledge, skills and communications. E-learning is easily accessible across multiple locations and very cost effective for training large numbers of users. According to Watson and Ahmad (2004), online learning is known as a key part of the future of educational culture. The entire new e-learning industry has been established, vendors have developed learning content, authoring tools and delivery/tracking systems.

For UiTM (Universiti Teknologi MARA Malaysia), e-learning will create an extended learning environment that supports, complements and enriches face to face classroom teaching and learning. i-Learn is the name for UiTM Learning Management System (LMS), which is currently on second version. The staff at the i-Learn centre (i-LeC) has developed and managed the system. Some of the tasks involve managing the system that includes entertaining queries via helpdesk, ensuring the stability of the system, adding new users, integrating the system with other systems in UiTM, and adding or removing remaining courses. Mohd Nor Mamat et al; (2006) stated that the i-Learn Portal is the platform that promotes information sharing and resources for the academicians and students of UiTM, and the i-Learn Portal also provides standard contents for the respective courses for student's perusal, extending the discussion or lecture at a class / office hours and many more advantages. i-Learn portal is accessible via internet where lecturers could access the system to create content and online collaboration with students. Students can also access the system from anywhere to download their course content. Lecturers will upload their notes and other materials in the portal, so that their students can refer to it as their references in their studies. However, to deliver and especially track results from the use of the content, it typically had to be custom programmed to work in a specific delivery environment. Different learning management systems had very different delivery environments. In education, the usefulness of content objects to support all kinds of learning activities was demonstrated by various projects. There has thus been a strong market incentive for content that is durable, portable between systems and reusable in a modular fashion. In other words, content that is interoperable.

This paper will discuss Sharable Content Object Reference Model (SCORM) standardization and other selected global standards such as IEEE Learning Technology Standards Committee (LTSC), and IMS Global Learning Consortium for UiTM i-Learn Centre to consider in the process of standardizing the i-Learn portal.

2. LMS Functions And The Standards

The choice of an LMS is an important part of an organization's e-learning strategy and it will affect the organization for long period of time. Watson et al., (2007) stated that, using an LMS that restricts the organization to the use of only content or authoring tools from the same vendor is a narrow strategy for the long term. A learner should be able to have a free choice of content from different vendors. This need for interoperability has been the main driving force of the e-learning standardization process.

2.1 LMS basic functions

According to Buendia et al., (2003), Learning Management System has some functions to be considered in its design. The LMS design approach is based on six basic functions such as follows:

1. Registration: manage student registration and administration process to be able to interact with LMS
2. Scheduling: organize schedules, curriculum, and additional resources
3. Delivery: deliver courses content, assignment, test result, and grade
4. Tracking: tracking process to student's progress and making report for every progress
5. Communication: arrange communication process with instructor, or student to each others by discussion forum, chat, mail, etc.
6. Testing: handle assessment to evaluate competence

i-Learn has developed almost all of the necessary functions as stated by Buendia et. al (2003). Among the functions and features that are developed in the i-learn system are as follows:

- content management system
- e-mailing
- discussion (forum)
- online assessment (evaluation)
- digital library
- calendar
- glossary
- Lecturer's Evaluation Online (LEO)
- CIMS (Course Information Management System).

2.2 Sharable Content Object Reference Model (SCORM)

The US Department of Defense (DoD) launched the Advanced Distributed Learning (ADL) Initiative in 1997 as a collaboration between government, industry and academia to provide a learning environment which allows the interoperability of learning tools and course content. ADL major product is the Sharable Content Object Reference Model (SCORM), which according to Neumann & Greys (2004), is a collection of specifications adapted from multiple sources to provide a comprehensive suite of e-learning capabilities that enable interoperability, accessibility and reusability of Web-based learning content.

According to Watson and Ahmed (2004), SCORM as an infrastructure makes it possible to deliver dynamically personalized learning using re-usable learning objects. Watson et al., (2007) highlighted that, SCORM defines a web-based learning "aggregation model" and "run-time environment" (RTE) for learning objects. Aggregation model identify how to aggregate the resources into the structured learning content, and for the Run time model describe the common language and data model for the communication between the LMS and the content. This enables the true interoperability between the content and LMS developed by the different vendors.

However, there are some issues in the implementation of SCORM standard by Learning Management System, where according to Watson and Ahmed (2004), the specifications mainly faced two specific problems:

- i. How to describe the learning object and resource packages that can be imported into any LMS.
- ii. How to enable content tracking and run-time communication between the content and the LMS.

SCORM focuses on the interfaces between content and an LMS and it does not identify the internal structure or features of an LMS. It is involved with the functionalities to deliver, track, report, manages learning content, learner progress and learner interactions. For this purpose it describes the basic infrastructure to use content objects but not the context in which they are used. It is often stated that SCORM is best used in web-based training for individual learners with a self-paced and self-directed

approach. But SCORM claims to be pedagogically neutral and may be used in any scenario, with or without the additional use of collaborative tools (Neumann & Geys, 2004).

Bob and Jones (2004) stated one of the issues in SCORM's implementation has been how to structure the order and presentation of SCO's to the user. In SCORM 2004; the version which was released in January, 2004, attempts to address this issue by adding a set of standard sequencing rules which is based on IMS Simple Sequencing. This adds to long-standing concerns that the complexity of SCORM poses a steep barrier to small commercial or individual developers. While more tools for SCORM creation are becoming available, their use still requires a good understanding of how SCORM is implemented. Finally, another technical issue involves cross-domain scripting. Unless a SCO is delivered from the same server as the LMS, built-in browser security safeguards will cause a scripting error.

Above all the stated issues however, Watson et al., (2007) stated that, in terms of reduced content development time and the option to use existing content provides direct cost-savings. It is an important advantage to adopt SCORM as a standard for the LMS. Another advantage of adopting SCORM for the LMS is to provide a cost effective solution for the organization, and the content has to be authored to industry standards so that it can be reused and interchanged across the platforms (Watson & Hardaker, 2005). Watson and Ahmed (2004) found that by having a free choice of content from different vendors an organization can reduce content costs dramatically by avoiding reinventing and customizing the same content (as cited in Blumenthal *et al.*, 1996).

Bob and Jones (2004) highlighted that all SCORM-compliant content must contain a "manifest" file (in XML) which lists all the resources (files) used and their relationship to each other (structure). They also said that resources for a SCORM learning object, called a "SCO" for "Sharable Content Object", are placed in a folder which is then saved as a zip archive. This zip file can be easily stored, shared or imported into SCORM-compatible software, usually an LMS such as Blackboard or WebCT.

The SCORM specifies a framework for content that meets the durability, portability, reusability, interoperability and accessibility of the e-learning content. On the other hand Rockley and Manning (2004) stated that SCORM compliant learning content is:

1. Delivered through a web browser
2. Described by meta-data
3. Organized as a collection or sequence
4. Packaged in such a way that it can be imported by a compliant learning management system or into a repository used by such a system.

Simsek and Akpinar (2005) mentioned that SCORM standards are not fully developed and has been rapidly changing, which is making it difficult to make an LMS conformant to SCORM requirements. Although SCORM has comprehensive manuals, finding SCORM compliant examples are not easy and finding information or experienced person about SCORM standards is extremely hard, especially when the technical help is needed. Furthermore, there are many SCORM tags and applying all of existing SCORM tags is a big burden to both programmer and user. Deciding the tags which are necessary is not a simple task most of the time. SCORM standards are highly based on the client scripting and need SCO files in HTML format not in a dynamic format, thus quizzes and other measurement tools in the SCOs must rely on client scripting. It restricts the flexibility of the programmer and also presents security weaknesses. Although the SCORM is widely known in e-learning companies and in related departments of universities, but the users, teachers and students usually do not know or understand the SCORM standards.

2.3 IMS Global Learning Consortium

According to Collier and Robson (2002), IMS is an industry/academia consortium that develops specifications based on the needs identified by its supporting members. It was started in 1997 by the

National Learning Infrastructure Initiative (NLII), organization sponsored by EduCause and is now an independent, non-profit corporation owned by its participating members. IMS produces specifications and also offers workshops, developer support, and executive briefings.

The scope for IMS specifications and standards cover most of the data elements used in "distributed and collaborative learning." IMS specifications promote the adoption of learning and educational technology and allow selection of best of breed products that can be easily integrated with other such products. These include a wide variety of technologies that support or enhance the learning experience, such as web-based course management system, learning management systems, virtual learning environments, instructional management systems, student administrative systems, e-Portfolios, assessment systems, adaptive tutoring systems, collaborative learning tools, web 2.0 social learning tools, learning object repositories, and so forth. These include technologies and products that support learning situations that involve support for collaborative learning involving learners and instructors. The learners may be in a traditional educational environment (i.e., a school classroom in a university), in a corporate or government training setting, or at home (Wikipedia.com).

2.4 IEEE Learning Technology Standards Committee (LTSC)

This standard specifies a high level architecture for information technology-supported learning, education, and training systems that describes the high-level system design and the components of these systems. This Standard covers a wide range of systems, commonly known as learning technology, education and training technology, computer-based training, computer assisted instruction, intelligent tutoring, metadata, etc. This standard is pedagogically neutral, content-neutral, culturally neutral, and platform-neutral. This standard (1) provides a framework for understanding existing and future systems, (2) promotes interoperability and portability by identifying critical system interfaces, and (3) incorporates a technical horizon (applicability) of at least 5-10 years while remaining adaptable to new technologies and learning technology systems. This Standard is neither prescriptive nor exclusive.

A conforming implementation shall complete the pro forma implementation conformance statement (ICS). A conforming implementation shall contain at least one LTSA system component other than the learner entity. For each process or store to which an implementation claims conformance, the implementation shall also conform to the requirements of the input and output flows of that process or store.

3. Comparative Analysis

SCORM specifies that an e-learning content has to be durable, portable, reusable, interoperable, and accessible. It focuses on the interfaces between content and an LMS and it does not identify the internal structure or features of an LMS. It is involved with the functionalities to *deliver, track, report, manages learning content, learner progress and learner interactions.*

Whilst the IEEE, the standard (1) provides a framework for understanding existing and future systems, (2) promotes interoperability and portability by identifying critical system interfaces, and (3) incorporates a technical horizon (applicability) of at least 5-10 years while remaining adaptable to new technologies and learning technology systems. IEEE LTSA specifies *learner entity, learner records, evaluation, learning resources, coach, delivery, interaction and multimedia* as the system components.

IMS Global Learning Consortium specifications and standards cover most of the data elements used in "distributed and collaborative learning" that promote the adoption of learning and educational technology which include a wide variety of technologies that support or enhance the learning experience, such as *web-based course management system, learning management systems, virtual learning environments, instructional management systems, student administrative systems, e-Portfolios, assessment systems,*

adaptive tutoring systems, collaborative learning tools, web 2.0 social learning tools, learning object repositories, and so forth.

From the analysis, most e-learning standardization organization such as SCORM and IEEE specifies the need of having a Report System or progress report for monitoring and tracking the basic information, such as lesson status, time and scores. UiTM i-Learn portal has yet to include a report or tracking component in its system. Besides that i-Learn should also include multimedia or collaborative learning tools such as video and interactive whiteboard in its LMS design to cater the IEEE and IMS standard conformance.

4. Recommendation

Based on the analysis, the detail shows that i-Learn has to design a Learner record/Tracking and Report system to comply with SCORM LMS standard. To comply with IEEE LTSC, i-learn would have to design a Learner record/tracking system which according to the LTSA, the Learner record/tracking system is to track the student's performance (history) that consists of course name, attempt, started on, last accessed on, title, times and status.

Other than a report system, the Collaborative Learning is another component required to comply with the IEEE LTSC and IMS Global Consortium. The Collaborative Learning refers to a collection of tools which learners can use to assist, or be assisted by others. Such tools include Virtual Classrooms (i.e. geographically distributed classrooms linked by audio-visual network connections), chat, discussion threads, and application sharing.

An e-portfolio can be seen as a type of learning record that provides actual evidence of achievement. To the extent that a Personal Learning Environment captures and displays a learning record, it also might be understood to be an electronic portfolio. E-portfolios, like traditional portfolios, can facilitate students' reflection on their own learning, leading to more awareness of learning strategies and needs (Jenny Moon, 2005). Results of a comparative research between paper based portfolios and electronic portfolios in the same setting, suggest use of an electronic portfolio leads to better learning outcomes (M. van Wesel & A. Prop, 2008).

A Virtual Learning Environment is another learning tool that is specified by IMS Global Consortium which normally work over the Internet and provide a collection of tools such as those for assessment (particularly of types that can be marked automatically, such as multiple choice), communication, uploading of content, return of students' work, peer assessment, administration of student groups, collecting and organizing student grades, questionnaires, tracking tools, etc. i-Learn should consider designing VLE in its system in order to economize on the time of teaching staff, especially when they are also involved in research and administration. The extent of the economy over traditional "talk-and-chalk" teaching is not yet clear, but for instructors without web development expertise, using a VLE absorbs less time and produces a more professional result. Other than that, it also provides a service for students who increasingly look to the internet as the natural medium for finding information and resources. VLE will also ensure that quality control requirements are met by providing a standard vehicle for collecting the required information and facilitate the integration of distance and campus-based learning or of learning on different campuses, which is very critical in UiTM.

Adaptive tutoring system or intelligent tutoring system (ITS) is one of the scopes of IMS standard which provides direct customized instruction or feedback to students. An ITS may employ a range of different technologies. However, usually such systems are more narrowly conceived of as artificial intelligence systems, more specifically expert systems made to simulate aspects of a human tutor.

i-Learn Portal should adopt SCORM standard, since SCORM standard has brought together the pieces of the learning specifications made by other organizations. Many universities in Malaysia such as the Open University, Universiti Teknologi Malaysia, and Universiti Malaysia Sabah are adopting SCORM standard. The advantages of adopting SCORM for the LMS is to provide a cost effective solution for the organization or UiTM specifically, and the content has to be authored to industry standards so that it can be reused and interchanged across the platforms (Watson & Hardaker, 2005). Watson and Ahmed (2004) found that by having a free choice of content from different vendors, an organization can reduce content costs dramatically by avoiding reinventing and customizing the same content (as cited in Blumenthal *et al.*, 1996). The need for interoperability has been the main driving force of the e-learning standardization process.

However, in order to make i-Learn conformant to SCORM requirements, some difficulties as outlined by Simsek and Akpınar (2005) should be put in full consideration.

5. Conclusion

This research has looked into SCORM standardization for i-Learn system to enhance and improvise the university's Learning Management System to be competent globally. The analysis has shown that there is a great importance for i-learn to design and develop a report system in its portal to enable the users (students/lecturers/instructor) to track the student's performance (history).

Since SCORM is an international standard for Learning Management System, i-Learn should adopt SCORM standard as the lead standard and be ready by developing its infrastructure to implement the SCORM specification, and thus lead UiTM to become competent as a world class university.

As a future research, a study on requirement analysis that covers the cost, issues and problem in implementing SCORM standardization, including the suggestion on the comprehensive ways to solve the problems should be done.

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